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Title: Weapons Active Repository for Radiographs and Film (WARF)

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Weapons Active Repository for Radiographs and Film (WARF)

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November 2021

Replace and add LA-UR number

A proposal for a new facility for:

- Preservation and digitization of weapons mission-critical film media (such as radiographs)
- Compliance with mandatory federal media storage requirements

The National Security Research Center at LANL

- NSRC's lineages dates to the Technical Library formed by J. Robert Oppenheimer in 1943 as part of the Manhattan Project

- Houses 75+ years of nuclear weapons research, designs, procedures, reports, etc.
    - Much of this material is film-based (radiographs, microfilm, microfiche, aperture cards, etc.)

- This is the largest collection of nuclear weapons information anywhere in the nation.

- The vast majority of the material is not duplicated anywhere else in the NSE

Sample of NSRC Holdings
Nuclear weapons designs
Assembly drawings
Nuclear test diagnostic data
Pre-shot reports
Post-shot reports and analyses
Supporting and confirmatory experiments
Subcritical experiments
Stockpile stewardship experiments
Milestone reports
Classified research journals
US/UK collaboration documents
Internal memoranda
Working group notes
Histories
Code manuals
Test problems

Open Inspection Finding from National Archives and Records Administration (NARA)

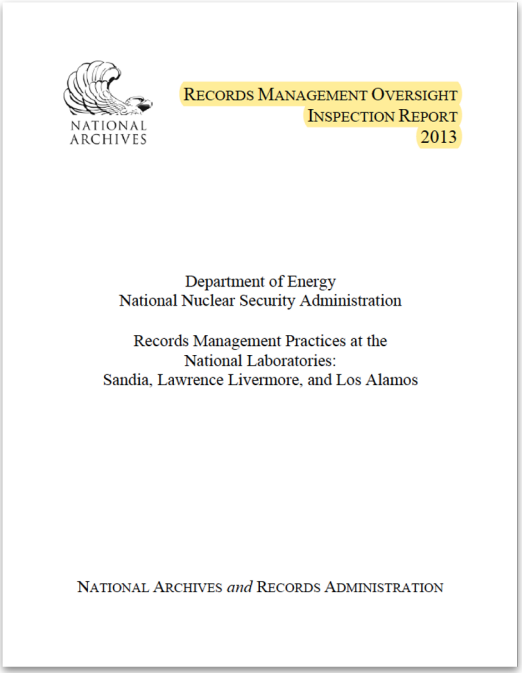
Report dates to 2013:

- Inspection finding from NARA notes LANL's improper storage of film media collection.
  - Finding states that LANL is out of compliance with several Federal statutes: 36 CFR 1234, 1236, 1237, 1238.
- Risk is NARA could force relocation of film media to a non-LANL controlled storage facility.

10-year search at LANL yielded no alternative to construction of dedicated, purpose-built facility. This is why WARF is required.

- Alternatives considered: 1) Existing NARA-compliant facility at LANL; 2) rehab of existing LANL facility; 3) build large, compliant storage container inside existing LANL facility.

Storage requirements for film media are:
35° F and 35% relative humidity


NATIONAL ARCHIVES

RECORDS MANAGEMENT OVERSIGHT INSPECTION REPORT 2013

Department of Energy
National Nuclear Security Administration

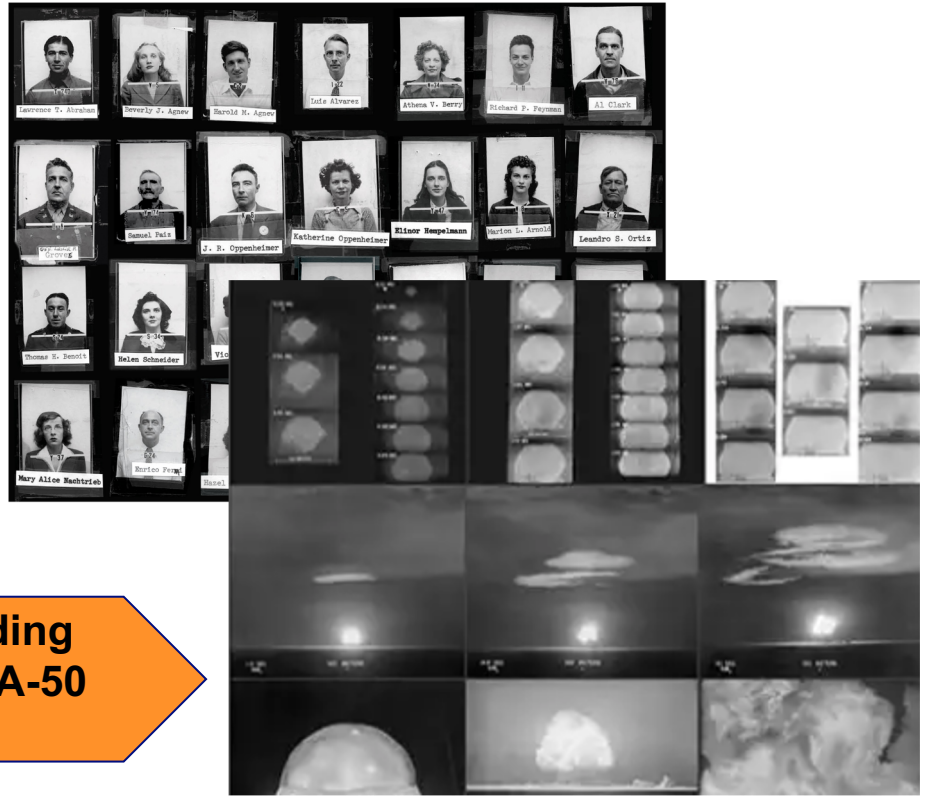
Records Management Practices at the
National Laboratories:
Sandia, Lawrence Livermore, and Los Alamos

NATIONAL ARCHIVES *and* RECORDS ADMINISTRATION

Los Alamos NATIONAL LABORATORY

Weapons Active Repository for Radiographs and Film: A laboratory for media preservation and digitization

- Over five million irreplaceable film media records essential to the nuclear weapons program are deteriorating rapidly
- Rocky Flats radiographs and other essential film media need to be preserved and digitized
- Years of improper storage have put film media collections at risk of degradation, and will render them unusable
- Current storage is out of compliance with National Archives and Records Administration (NARA) regulations



We need your support to prioritize funding for this mission critical facility in the NA-50 investment portfolio

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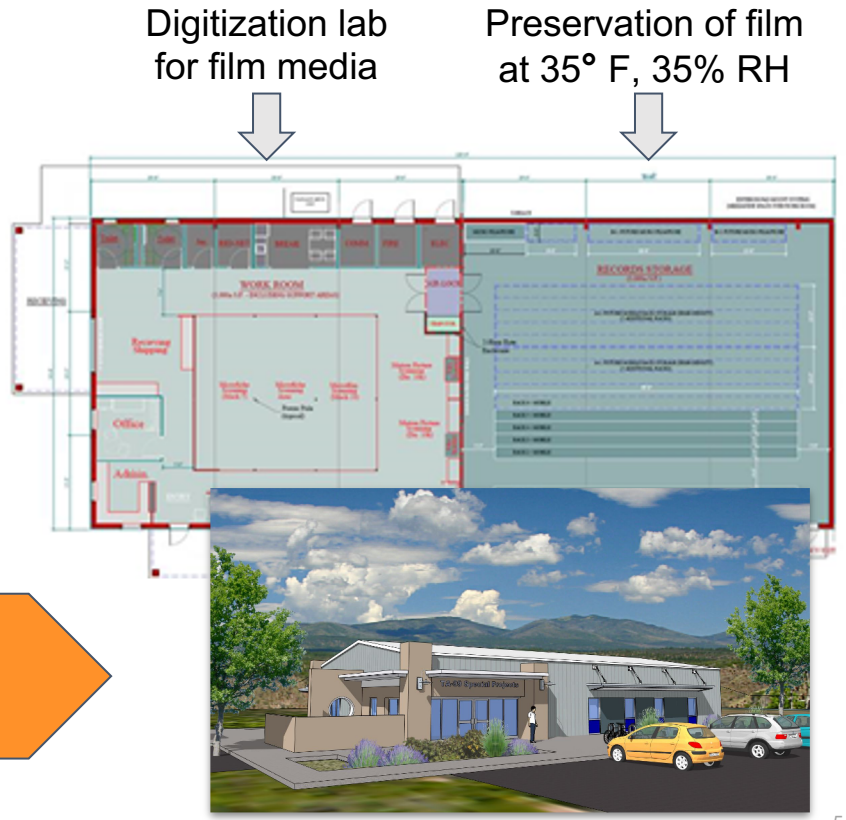
Over five million irreplaceable film media records essential to the nuclear weapons program are deteriorating rapidly

Proposing a new $16M - $18M facility

- Preserve and digitize over 5 million film media records with significant technical value to the weapons program

- New 6,000 sq ft building at LANL TA-3
  - 3,000 sq ft for **climate-controlled storage** meeting national standards
  - 3,000 sq ft of laboratory space to **increase the rate of digitization** for film media



New climate controlled facility is needed to stop rapid degradation of LANL's film media

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Rocky Flats radiographs and other film media need to be preserved and digitized

Radiographs: Rocky Flats production, NTS tests, and LANL surveillance (critical to NA-12, NA-19)

- High-fidelity film radiographs are used to understand build defects in pits, resolve significant findings and other stockpile questions, and assess the effects of aging. **This historical data about pits is mission-critical and irreplaceable.**

Rocky Flats bomb books on microfilm (critical to NA-19)

- Manuals for each individual pit build, including specification exceptions and documentation of processes.
- Inform current DA specs of historical acceptance. Helps PA meet key delivery milestones, improve pit acceptance rates and capacity, and avoid costs of around **$3-5M and weeks of lost schedule per reworked pit**.

Nuclear testing bomb books on microfilm / microfiche (critical to NA-11, NA-12)

- Task Order Requests: May include test purpose and any supporting documentation (requirements, specifications, drawings, methodology, etc.). Task Order Requests exist for nearly every nuclear test. **Task Order Requests can contain documents from Y-12, Pantex, and Rocky Flats found nowhere else**.

Motion picture film and photographic negatives (critical to NA-11, NA-19)

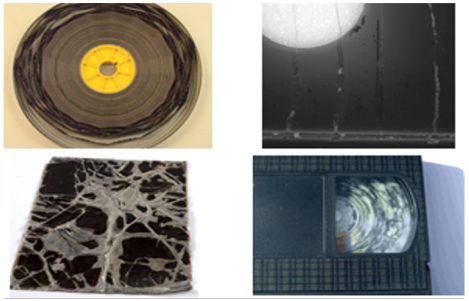
- Still images and movies of nuclear tests, test assembly processes, experimental hardware, and much more. **Useful for computational modeling and data re-analysis.**

Current Inventory			
Type	**Qty**	**Creation Dates**	**Digitized**
Radiographs	3.1M	1954-1994	0.32%
Photographic negatives	1M	1943-2000	1%
Aperture Cards	880K	1963-1999	41%
Microfiche	200K	1956-1999	2%
Microfilm	30K	1956-1999	1%
Motion picture film reels	20K	1943-1990	43%
Video tapes	10K	1980-2000	72%
Audio tapes and audio film	1K	1960-2000	61%
>5.2M			

Years of improper storage have put film media collections at risk of degradation, and will render them unusable

Records are currently stored in multiple portable containers at a remote site, making them subject to degradation and difficult to access

Media degradation pictured here is generic - see classified addendum for actual examples



Current storage is <u>not</u> in compliance with mandatory Federal standards

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The NSRC film media collection is mission-critical

- **Robert Putnam, LANL Weapons Production, Executive Advisor (supporting NA-19)**
  - "[The film media collection] impacts ALDWP at a cost of around $3-5 million per scrapped or reworked pit, with at least a month of schedule impact per rejected pit. The innovative processes to provide historical information digitally enables Weapons Production to produce evidence of historically less stringent acceptance criteria which helps meet key delivery milestones and improve pit acceptance rates and capacity."
- **Scott Watson, LANL Analytics, Intelligence and Technology (supporting NA-12)**
  - "…we were recently able to recover from the archives data taken in the mid-1960s that was useful to the weapons program. This data could not be replicated today at any price and therefore was, by definition, 'invaluable'."
- **David Prochnow, LANL Weapons Production and Victoria Longmire, LANL Actinide Analytical Chemistry (supporting NA-19)**
  - "The analytical chemistry information on hundreds of items still held at Los Alamos. This is the most accurate assay data and is only in the records held at NSRC. Redoing such assays could cost >$100K/item."
- **Earl Whitney, LANL W88 Senior Engineer, Weapons Engineering (supporting NA-11, NA-12)**
  - "Several examples exist of complex experiments that were conducted to interrogate implosion phenomena. Only later, in discussions with senior personnel (who were familiar with the historical records), did we discover that the experiments had already been performed for the first time more than 40 years previous..."

The NSRC film media collection is mission-critical (continued)

- **Joe Watts, LANL Weapons Production (supporting NA-19)**
  - “Radiography was used extensively throughout pit manufacturing to ensure components, subassemblies, and finished pits meet manufacturing specifications. Very subtle differences in shade and texture of film images are hard to replicate in standard quality scanned images. Highly-trained radiography technicians can detect anomalies present in radiographic film images. A radiograph that contains a radiographically detected “defect” often cannot be detected by inexperienced individuals. This is especially apparent in high to low density areas.”
- **Kevin Smale, Director, LANL Office of Annual Assessment (supporting NA-11)**
  - “[The well-head radiographs from NTS] may in fact be included in the X Archive but the actual film (not digitized version) is the unique (ground truth) and should also be retained in secure/long term storage. Basically they are invaluable in that they represent part of the evidence that the nation expended tremendous amount of capital (money) to create. As with the RFP radiographs….my hope is that this actual film has been pulled into secure/safe long-term storage somewhere.”

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Backup Slides

GPP Mission Needs Statement

Need:
Los Alamos National Laboratory's (LANL) film-based archival media is not in compliance with federal mandates for film media storage, as outlined in National Archives and Records Administration (NARA) requirements. The film media contains irreplaceable items used on a daily basis for LANL's pit production mission, pit surveillance, addressing Special Finding Investigations, and modeling and simulation. This media requires specialized, refrigerated environmental controls to prevent deterioration and reduce fire risks. The film media is composed of radiographs, microfilm, microfiche, photo negatives, motion picture films, video tapes, and audio tapes.

Justification:
A new facility is proposed that will meet NARA's mandatory environmental control standards and will also have space to establish production-scale digitizing labs to digitize the film media housed in this facility. The facility will slow degradation through appropriate climate control and provide sufficient space for digitization of the media, ultimately reducing the risk of permanent loss of the collection. Having a NARA compliant facility will also reduce the risk of a mandate that all film media collections be transferred to a NARA facility approved facility resulting in the loss of control over the collection with immeasurable programmatic loss.

NA-50 Prioritization Criteria

Safety Risk Reduction

- Reduced safety risk to workers who have to retrieve film media by climbing over pallets.
- To get to some boxes, laborers need to be hired to pull the heavy crates containing radiographs out of the way with a pallet jack and then bring a forklift to place the crates on the ground and out of the way so that they can retrieve bottom shelf boxes.
- Central aisle of the transportainers are filled with pallets since there is simply not enough room.

Sustainability & Productivity ROI

- New facility will be built to modern standards specifically for storage and scanning/digitizing operations. Facility will meet High Performance Sustainability Building (HPSB) standards.
- Facility footprint will reduce from 14 temporary facilities down to one facility
- New facility will be purpose-built, with much better insulation, and power handling than current facilities which have only minimal insulation from heat and cold environments.

Program Risk Reduction

- Irreplaceable nuclear weapons engineering and pit production information is degrading rapidly. Even partial loss of this information will have significant negative impact on NNSA's mission.
- Loss of detailed pit manufacturing information will negatively impact both workflow and product acceptance. This could cost the nation $3-5M per pit manufactured by LANL

Deferred Maintenance Reduction

- Current facilities have numerous maintenance and accessibility issues:
  - Frequent door closure issues...critical item for a VTRs.
  - Frequent VTR alarm arming issues...another critical issue for VTRs.
  - Snow and ice buildup prevents safe opening and closure of VTR.
  - Snow and ice build-up on inaccessible roads make accessing facilities difficult or impossible.

Specific content at risk

Microfilm & Microfiche	Aperture Cards	Radiographs	Photo negatives
● Rocky Flats Bomb books ● Task order requests ○ Test preparation details: Material analysis, production orders, parts testing, chemical and certification reports, installation, assembly, processes, traveler documents, drawings ● Nuclear material shipments ● Nuclear material measurements	● Weapons engineering drawings and specifications ● EG&G detector design records	● High fidelity x-rays of Rocky Flats pits	● Manhattan era to 1990s ● Technical photographs ○ Often, photos are the only record of changes to test devices before detonation

Motion Picture film	Video Tapes	Audio Tapes
● Weapons testing ○ Nuclear testing operations ● Weapons development ○ Weapon assemblies/disassemblies ● Documentaries	● SRD meetings ● Colloquiums on weapons technologies, assemblies, and disassemblies ● Lectures by Nobel Prize winners, weapons designers, and scientists	● Oral histories of retired LANL scientists, engineers, and senior leaders

See classified addendum for specific examples

Retrieved Media to Support Customer Information Requests

Type	QTY Retrieved from Total Collection	Information Content
Aperture Cards	148K	Weapons engineering drawings were digitized by KCNSC for Weapons Engineering
Microfiche	26K	Nuclear materials transport records with analytical chemistry information for Weapons Production
Microfilm	30K	174 microfilm reels with W87 bomb books and 155 Rocky Flats microfilm reels with manufacturing information for Weapons Production
Motion Picture	4.7K	Nevada and Pacific test shots, weapons assembly footage, and weapons experiments for the Weapons Program
Video	5K	Technical lectures, weapon testing and assembly footage, weapons program experiments for the Weapons Program